WHAT IS CLAIMED IS:

1. A method of forming a silicon oxide film on a substrate by the use of vapor phase chemical reaction using a plasma CVD method , comprising the steps of:

separating a plasma generating region from a deposition region which includes excitation oxygen molecules and excitation oxygen atoms ,plasma of first gas containing oxygen atoms being formed in the plasma generating region while second gas containing silicon atoms being supplied into the deposition region; and

intentionally controlling first quantity of the excitation oxygen molecules and second quantity of the excitation oxygen atoms.

2. A method as claimed in claim 1, wherein:

the intentional control is carried out such that the second quantity is relatively reduced for the first quantity.

3. A method as claimed in claim 2, wherein:

the intentional control is carried out by changing a deposition condition of the silicon oxide film.

4. A method as claimed in claim 3, wherein:

the deposition condition comprises pressure in the deposition region.

5. A method as claimed in claim 1, wherein:

the deposition region is specified by an optical emission spectrum,

the excitation oxygen molecule has a first luminescent peak near 761 nm, and

the excitation oxygen atom has a second luminescent peak near 777 nm.

6. A method as claimed in claim 5, wherein:

a relationship between a first area A (O2) of the first luminescent peak and a second area A (O) of the second luminescent peak near satisfies a relation of $10 \times A(O2) > A(O)$.

7. An apparatus for forming a silicon oxide film on a substrate by the use of a plasma CVD method , comprising :

a plasma generating region which forms plasma of first gas containing oxygen atoms;

a deposition region which is placed on the substrate so as to be separated from the plasma generating region and which includes excitation oxygen molecules and excitation oxygen atoms;

a substrate holding mechanism which is provided with the substrate in the deposition region;

a supply unit which supplies second gas containing silicon atoms into the deposition region; and

a control unit which intentionally controls first quantity of the excitation oxygen molecules and second quantity of the excitation oxygen atoms.

8. An apparatus as claimed in claim 7, wherein:

the control unit comprises a optical emission spectrometer which spectrally detects luminescence of the deposition region.

9. An apparatus as claimed in claim 8, wherein:

an optical transmitting window is arranged at the chamber wall, which is preferably placed in the deposition region. and

the optical emission spectrometer spectrally measures a light beam passing through the light transmitting window.

10. An apparatus as claimed in claim 9, wherein:

the deposition region has a luminescent spectrum which is spectrally measured by the optical emission spectrometer,

the excitation oxygen molecule has a first luminescent peak near 761 nm, and

the excitation oxygen atom has a second luminescent peak near 777 nm.

11. An apparatus as claimed in claim 10, wherein:

a deposition condition is controlled such that a relationship between a first area A (O2) of the first luminescent peak and a second area A (O) of the second luminescent peak near satisfies a relation of 10 * A (O2) > A (O).

12. An apparatus as claimed in claim 11, wherein:

the deposition condition is controlled by changing pressure of the deposition region.

13. A method of forming a silicon oxide film on a substrate by the use of vapor phase chemical reaction using a plasma CVD method , comprising the steps of:

separating a plasma generating region from a deposition region which includes excitation oxygen molecules and excitation oxygen atoms ,plasma of first gas containing oxygen atoms being formed in the plasma generating region while second gas containing silicon atoms being supplied into the deposition region; and

intentionally controlling first emission intensity of the excitation oxygen molecules and second emission intensity of the excitation oxygen atoms.

14. A method as claimed in claim 13, wherein:

the intentional control is carried out such that the second emission intensity is relatively reduced for the first emission intensity.